PM 474 (get 582-550 under →)

ENZYME-TREATED TOBACCO STEMS

Dr. Henri C. Silberman of the Research and Development Department of Philip Morris Incorporated disclosed to me on January 30, 1967 the results of his investigation on the treatment of tobacco stems with enzymes which has produced tobacco material that can be made into a desirable cigarette filler which has increased filling power and decreased tars and nicotine.

(C) The present invention ~~Essentially, Dr. Silberman's~~ invention comprises soaking tobacco stems in an aqueous solution of polysaccharide-hydrolyzing enzymes, allowing the enzymes to act on the stems, and pressing or rolling the treated and softened stems to flatten them. The product is dried and cut as required for use in smoking products. It retains a useful degree of softness and flatness when dry, and when shredded and used as cigarette filler provides a cigarette which has increased filling power and a lower tar and nicotine content.

(C) (A) Tobacco stems and midribs have been generally found to be ~~are~~ objectionable in smoking tobacco blends, particularly those for cigars and

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cigarettes, because of their burning qualities and their stiffness which may lead to deformed or punctured wrappers. It is well known in tobacco processing that these tobacco parts, separated from the leaf, may be softened by moisture or steam, and then flattened by rolling to compress and spread the stem to a form which may be shredded in the manner of tobacco leaf. This process is wholly satisfactory, however, because when they are dried the rolled stems become brittle and, during shredding, produce much dust and undesirable fine particles; also the stems tend to resume their unflattened condition as they cool and dry. Efforts to plasticize the rolled stems by application of softeners such as glycerine have not had enough effect to overcome these problems. The stiffness of the rolled product makes it capable at times of puncturing the wrapper in the manner of the untreated stems.

Certain components of tobacco smoke are sometimes regarded as undesirable, and decreased delivery of such components as total particulate matter and nicotine is advantageous.

Dr. Silberman has discovered a means for softening tobacco stems and midribs in such a way that they

retain their pliability when crushed and dried to room conditions. As a result of the treatment, they remain flattened and do not produce large amounts of fines when cut, shredded, or rolled. The energy required for the rolling process is also reduced.

According to Dr. Silberman's invention, the stems are treated with an aqueous solution of cellulolytic enzymes in catalytic amounts prior to rolling. They are immersed in the solution, drained, and then aged for a time. They are rolled in the usual fashion on unheated or steam-heated rolls.

The treating solution may contain glycerine also as a plasticizing agent to aid in the softening action. The stems may remain in the solution throughout the aging period, although this is not necessary for the action of the enzyme. This kind of treatment results in the absorption of an excessive quantity of solution which must be squeezed from the stems during the rolling process and then recovered. Preferably, the stems are immersed for a period of 5 to 30 minutes and then removed from the solution and aged for 15 minutes to 24 hours at

room temperature or above. At this time the moisture content may be in the neighborhood of 50% of the total weight. The weight of the solution may range from 20 to 250% of the tobacco weight in the more general view of the process.

Cellulolytic enzymes which are useful in the practice of the invention are pectinase, hemi-cellulase, and cellulase, in combination. These are found, for example, in fungal or bacterial preparations derived from Aspergillus niger or Aspergillus oryzae. All three enzymes may be present in a single preparation or it may be necessary to combine more than one such preparation to provide the combination of three types of enzymes. Such enzyme systems, in general, are derived by the treatment of plant extracts, extracts from animal organs, and from fungal and bacterial cultures. Several commercial cellulase preparations and the organisms from which they are prepared are listed in a paper by C. S. Walseth (TAPPI 35:228, 1952). Specific commercial materials which have been found to include the three enzymes are Cellulase No. 35 (Rohm and Haas Co.), "Cellase" 1000 (Wallerstein Co.), Cellulase 4000 (Miles Laboratories), Lipase B (Rohm and Haas Co.), and Pectinase (Nutritional Biochemical Corp.). These preparations contain varying

amounts of other enzymes, such as protease, amylase, lipase, and catalase. These additional enzymes are not necessary for the purpose of the present invention but it has been found that they have no undesirable effects on the products of the present invention. The pH of the solution during the enzyme treatment affects the time required at a fixed temperature and with some stems such as burley it is advantageous to adjust the pH to an optimum range of 3.5 to 6.0 by adding acetic acid.

Aging may be at a temperature of 20° to 80°C. for 15 minutes to 24 hours, the shorter time being coupled, ordinarily, with a higher temperature.

Supplementary plasticization may be had by adding any of the humectants or plasticizers known in the tobacco processing industry such as glycerol, propylene glycol, or triethylene glycol. Flavorants, tobacco solubles, and other casings may be included in the treating solution. The folling may be replaced by the shearing process described in U. S. Patent 3,204,641, wherein the fibrous structure of the stems is torn apart. The enzyme treatment softens the

intercellular binders, thus aiding in tearing apart the fibrous structure. If desired, a simple pressing between flat platens may be used.

The flattened product, while still wet, may be freeze-dried ~~according to Dr. Silberman's invention~~ in accordance with the disclosure in copending application S.N. ——, filed by the same inventor, as fled forth hereinafter. ~~disclosed in PM #498.~~

~~Dr. Silberman's invention may be illustrated by~~ The following examples are illustrative: